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SITE INSPE
CHROMALOX DIVISION - EM
MURFREESBORO, RUTHERFORD

SITE INSPECTION REPORT

Final

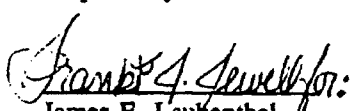
Prepared for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region 4
Atlanta, GA 30303

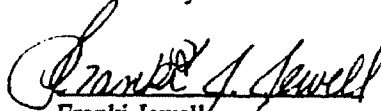
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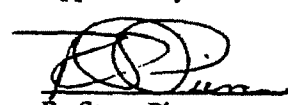
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EXECUTIVE SUMMARY

Chromalox Division - Emerson Electric (Chromalox) is an electric heating element manufacturer that has operated since 1956. The site, located in the midwest portion of Murfreesboro, Tennessee, is bound on the west side by Jones Boulevard, to the north by Lokey Avenue, to the east by Memorial Boulevard, and to the south by Ridgely Road. The geographical coordinates are 35°50'13" west latitude and 86°23'26" north longitude.

Chromalox bought the 26.9-acre site property in 1956 from the Lytle family, who previously used the land for farming. Chromalox began operations in 1956 and remains an active manufacturer of electric heating units. Emerson Electric bought Chromalox in 1967. In 1995, Chromalox sold 6.9 acres to the Boys and Girls Club of America, reducing the size of the site to 20 acres.

Chromalox utilized an electroless nickel plating process from 1978/1979 through August 1989. Chromalox ceased metal plating operations in 1989 (Ref. 5). Through this process metal plating is accomplished without electricity by soaking the parts to be plated in a metal plating solution. A number of hazardous wastes are or have been produced by Chromalox during the various tasks associated with the manufacture of electric heating units including the following: trichloroethylene (TCE), tetrachloroethylene (PCE), xylene, electroless nickel plating solution, acetone, 1,1,1-trichloroethane, waste paint products, electrical resins, varsol solvent, waste oils, waste corrosive liquids, waste flammable liquids, and hazardous waste solids. These wastes are and have been stored on a concrete pad on the east side of the main plant building, which is now called the hazardous waste storage area. The hazardous waste storage area is the potential source area on site. Since 1964, minor spills of PCE and TCE have been reported in this area.

In 1993, the Tennessee Department of Environment and Conservation (TDEC) conducted a preliminary assessment (PA) at the site. Based on the data presented in the PA, TDEC recommended a site inspection (SI) be conducted at Chromalox. The U.S. Environmental Protection Agency tasked PRC Environmental Management, Inc. to conduct an SI at Chromalox. Five surface and five subsurface soil samples were collected during the site inspection (SI) conducted at Chromalox from March 31 through April 2, 1997. Cadmium, chromium, copper, lead, magnesium, nickel, silver, and zinc were detected at elevated levels in surface soil samples. Several semivolatile organic compounds as well as the following pesticides were

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) tasked PRC Environmental Management, Inc. (PRC) under the Superfund Technical Assessment and Response Team (START), Contract Number 68-W5-0021, Technical Direction Document No. 04-9701-0012, to conduct a site inspection (SI) at the Chromalox Division - Emerson Electric (Chromalox) site located in Murfreesboro, Rutherford County, Tennessee.

The primary objective of an SI is to determine whether a site has the potential to be placed on the National Priorities List (NPL). The NPL identifies sites where releases or threatened releases of hazardous substances pose a serious enough threat to public health or the environment to warrant further investigation and possible remediation under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the Superfund Amendments and Reauthorization Act of 1986.

Information gathered during the SI is used to generate a preliminary Hazard Ranking System (HRS) score. The HRS is the primary criterion EPA uses to determine whether a site should be placed on the NPL. SIs are generally conducted at sites where additional environmental sampling or monitoring well installation is necessary to fulfill HRS documentation requirements. Further, an SI is conducted to address site issues not adequately resolved in previous investigations.

Specifically, the objectives of the SI are as follows:

- To obtain and review relevant file material
- To collect samples to attribute hazardous substances to site operations
- To collect samples to establish representative background levels
- To evaluate target populations for the groundwater migration, surface water migration, soil exposure, and air migration pathways
- To collect any other missing HRS data
- To document current site conditions
- To develop a site layout map

This report documents the results of the SI that START personnel conducted at the Chromalox site from March 31 through April 2, 1997. START personnel gathered and reviewed information from the Tennessee Department of Environment and Conservation (TDEC) and from EPA Region 4 CERCLA files. START prepared a site-specific field study plan (FSP), which was submitted to EPA for approval.

2.0 SITE BACKGROUND

This section describes the Chromalox site and its environmental setting, regional geology and hydrogeology, current and past operations, and potential source areas. This text is modified from the Preliminary Assessment report of the Chromalox facility that the TDEC prepared in 1993 (Ref. 1).

2.1 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

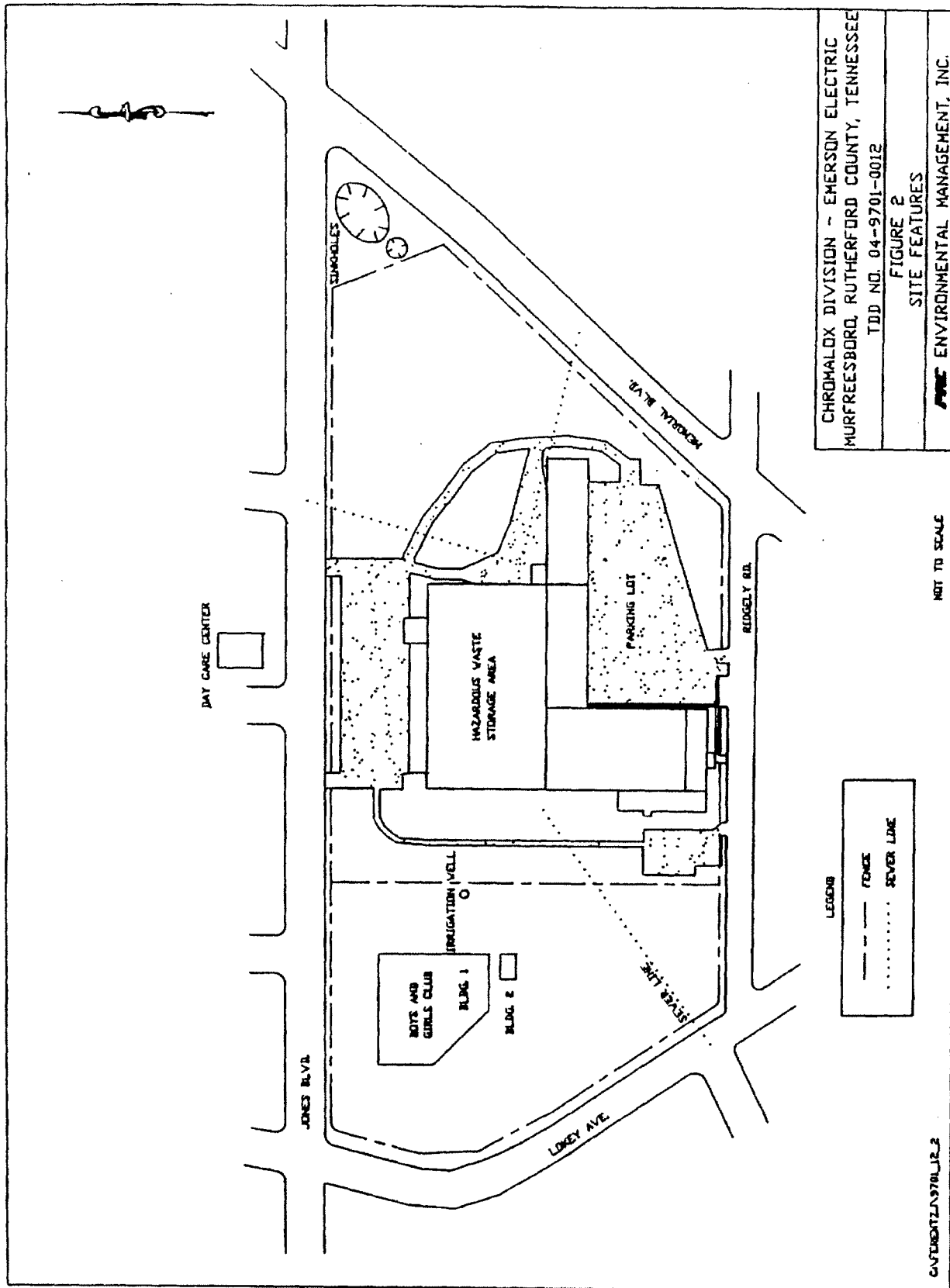
Chromalox is an electric heating element manufacturer that has operated since 1956 (Ref. 1). The site, located in the midwest portion of Murfreesboro, Tennessee, is bound on the west side by Jones Boulevard, to the north by Lokey Avenue, to the east by Memorial Boulevard, and to the south by Ridgely Road (see Figures 1 and 2) (Refs. 1, p. 2; 2; 3). The geographical coordinates are 35°50'13" west latitude and 86°23'26" north longitude, with the reference point being the approximate center of the site (Refs. 1, p. 2; 3).

Chromalox is located on 26.9 acres of land. The main plant building covers a large portion of the site; however, in 1995, Chromalox sold 6.9 acres to the Boys and Girls Club of America, reducing the size of the site to 20 acres (Refs. 1, p. 2; 4; 5; 6). The Boys and Girls Club of America built a facility on the property in late 1995 (Ref. 7).

The Murfreesboro/Rutherford County area has a temperate climate with short, mild winters and hot, humid summers (Refs. 1; 8). The average annual temperature in this area is about 59 °F. The mean annual rainfall for Murfreesboro is 49 inches, and the annual lake evaporation in the area is 37.5 inches, yielding a net annual precipitation of 11.5 inches (Ref. 9). The 2-year, 24-hour rainfall for the area is approximately 3.5 inches (Ref. 9).

The land appears to be fairly level. One prominent sinkhole is located in the northeast corner of the site, and several low karst-like depressions, one of which is located in the northeast corner, lead into the sinkhole (Refs. 2; 7). The U.S. Geological Survey (USGS) 7.5-minute topographical map





CHROMALOX DIVISION - EMERSON ELECTRIC
 MURFREESBORO, RUTHERFORD COUNTY, TENNESSEE
 TDD NO. 04-9701-0012
 FIGURE 2
 SITE FEATURES
 PENC ENVIRONMENTAL MANAGEMENT, INC.

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shows several sinkholes throughout the northeastern and southeastern portions of the site (Ref. 2). The sinkholes in the southeastern portion of the site appear to have been filled in during excavation prior to building the Boys and Girls Club facility (Ref. 7). There is no obvious sign of stressed vegetation at the site, which is surrounded by an 8-foot fence with three-strand barbed wire (Refs. 1, p. 2; 10; Appendix A).

Land use in the area is primarily industrial/commercial; however, a residential area is located to the north of the site. The site is located approximately a quarter mile from two other Superfund sites: Van Water and Rogers (TND987768561) and Rosebank Drive Dump Site (TND987787058) (Ref. 1, p. 3).

2.2 SITE OPERATIONS AND REGULATORY HISTORY

Chromalox bought the 26.9-acre site property in 1956 from the Lytle family, who previously used the land for farming. Chromalox began operations in that year and remains an active manufacturer of electric heating units. Emerson Electric bought Chromalox in 1967 (Refs. 1, p. 2; 4; 10; 11).

The facility utilized an electroless nickel plating process from 1978/1979 through August 1989. Chromalox ceased metal plating operations in 1989 (Ref. 5). Through this process metal plating is accomplished without electricity by soaking the parts to be plated in a metal plating solution. According to Chromalox representatives, the operation was small and sporadic, and the wastes from this process were disposed of under regulations of the Resource Conservation and Recovery Act (RCRA) (Refs. 1, p. 3; 10).

Prior to RCRA's regulation, wastes were stored in a common area and then taken to a municipal dump, possibly one or all of the three municipal dumps operating at that time (Ref. 1, p. 3). Chromalox is now classed as a RCRA large-quantity generator, storing hazardous wastes for up to 90 days and then having the wastes removed and taken to a hazardous waste disposal facility (Refs. 1, p. 3; 10; 12).

Since 1964, an area on the east site of the Chromalox main plant building now known as the

hazardous waste storage area, has been for storing hazardous waste (See Figure 2). Along the west side of the building is an operational, liquid nitrogen tank, immediately north of which is a fenced area that once housed a hydrogen tank. South of the liquid nitrogen tank are two sets of concrete supports that once held propane tanks (see Figure 2) (Refs. 1, p. 2; 10).

2.3 PREVIOUS RELEASES AND INVESTIGATIONS

A number of hazardous wastes, including the following, are or have been produced by Chromalox during the various tasks associated with the manufacture of electric heating units: trichloroethylene (TCE), tetrachloroethylene (PCE), xylene, electroless nickel plating solution, acetone, 1,1,1-trichloroethane, waste paint products, electrical resins, varsol solvent, waste oils, waste corrosive liquids, waste flammable liquids, and hazardous waste solids (Refs 1, p. 3; 5; 13, p. 3).

Minor spills have been reported in the hazardous waste storage area (Ref. 13, p. 3) (Figure 2). A Phase I assessment that Chromalox performed in 1988 concluded that this area, among others, required further investigation. Sampling data in the Phase I report and in a subsequent Phase II report showed the area to be contaminated with relatively high (less than 450 parts per million) levels of volatile organic compounds (VOC). Chromalox contracted Dames & Moore in 1992 to perform a removal action on a 423-square-foot portion of this area following the Phase II report (Refs. 1, p. 3; 13, p. 3). The contamination was limited to the surficial soil, which was excavated and stored in an on-site pile (Refs. 13, pp. 3, 4, and 5). The pile of contaminated soil was removed and disposed of in a hazardous waste landfill (Ref. 13, p. 7). As part of the removal, a new concrete pad was constructed in the area and this hazardous waste storage area is currently used to store hazardous wastes generated by site operations.

Spills of PCE and TCE in the hazardous waste storage area have occurred when open drums of waste solvent overfilled with rainwater. Samples collected during the 1988 Phase I assessment showed soil contaminated with high levels of ethylbenzene, xylene, PCE, TCE, and degradation byproducts (Refs. 1, p. 3; 13).

2.4 POTENTIAL SOURCE AREAS

The hazardous waste storage area is the potential source area on site. Spills of PCE and TCE have occurred in this source area in the past (Ref. 1, p. 3).

3.0 SITE SAMPLING LOCATIONS AND PROCEDURES

The purpose of the SI sampling was to collect data to evaluate significant contamination, migration, and exposure pathways. Tables 1 and 2 outline the number and type of samples collected and the rationale for selecting each sample location. Figure 3 shows the sample locations, which were selected based on background information available during preparation of the FSP and during the site sampling visit conducted from March 31 through April 2, 1997 (Ref. 7). Sampling and field quality assurance/quality control procedures for SI field activities were conducted in accordance with the 1996 EPA Region 4 Science and Ecosystem Support Division, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual* (EISOPQAM).

3.1 SURFACE SOIL SAMPLING

START personnel collected five surface soil samples from potentially contaminated soil areas located within the Chromalox facility property. In order to attribute potential contaminants detected in on-site soil samples to site operations, START personnel collected one background sample from north of the facility property, across Jones Boulevard, near the day-care center (Ref. 7). Using stainless-steel spoons and Pyrex™ bowls, START personnel collected surface soil samples from 0 to 1 foot below ground surface (bgs) at each sampling location (Ref. 7). Figure 3 shows sampling locations, and Table 1 describes the surface soil sample locations. All sampling was in accordance with the EISOPQAM (EPA, 1996).

3.2 SUBSURFACE SOIL SAMPLING

START personnel collected five subsurface soil samples from potential source areas located within the Chromalox site property. The subsurface samples were collected from a depth of 3 to 4 feet bgs. In addition, START personnel collected one background subsurface soil sample (Ref. 7).

TABLE 1
SURFACE SOIL SAMPLE LOCATIONS

Sample Number	Location	Rationale
CD-SS-01	North of the facility in the field across Jones Boulevard.	Background soil sample for comparison to on-site samples.
CD-SS-02	Northeast corner of the facility, in the area of the sinkhole.	Determine presence or absence of hazardous substances.
CD-SS-03	Western portion of the facility, west of main plant building.	Determine presence or absence of hazardous substances.
CD-SS-04	North-central section of facility, east of main plant building.	Determine presence or absence of hazardous substances.
CD-SS-05	Central section of facility; gravel-covered area near the hazardous waste storage area.	Determine presence or absence of hazardous substances.
CD-SS-06	Central section of facility; area east of the hazardous waste storage area.	Determine presence or absence of hazardous substances.

Notes:

CD - Chromalox Division
SS - Surface soil

TABLE 2
SUBSURFACE SOIL SAMPLE LOCATIONS

Sample Number	Location	Rationale
CD-SB-01	North of the facility in the field across Jones Boulevard - 3 to 4 ft bgs.	Background subsurface soil sample for comparison to on-site samples.
CD-SB-02	Northeast corner of the facility, in the area of the sinkhole -3 to 4 ft bgs.	Determine presence or absence of hazardous substances.
CD-SB-03	Western portion of the facility, west of the main plant building -3 to 4 ft bgs.	Determine presence or absence of hazardous substances.
CD-SB-04	North-central section of facility, east of the main plant building - 3 to 4 ft bgs.	Determine presence or absence of hazardous substances.
CD-SB-05	Central section of facility; gravel-covered area near the hazardous waste storage area - 3 to 4 ft bgs.	Determine presence or absence of hazardous substances.
CD-SB-07	Central section of facility; area east of the hazardous waste storage area - 3 to 4 ft bgs.	Determine presence or absence of hazardous substance.

Note:

CD - Chromalox Division
 SB - Subsurface
 bgs - Below ground surface
 ft - Feet

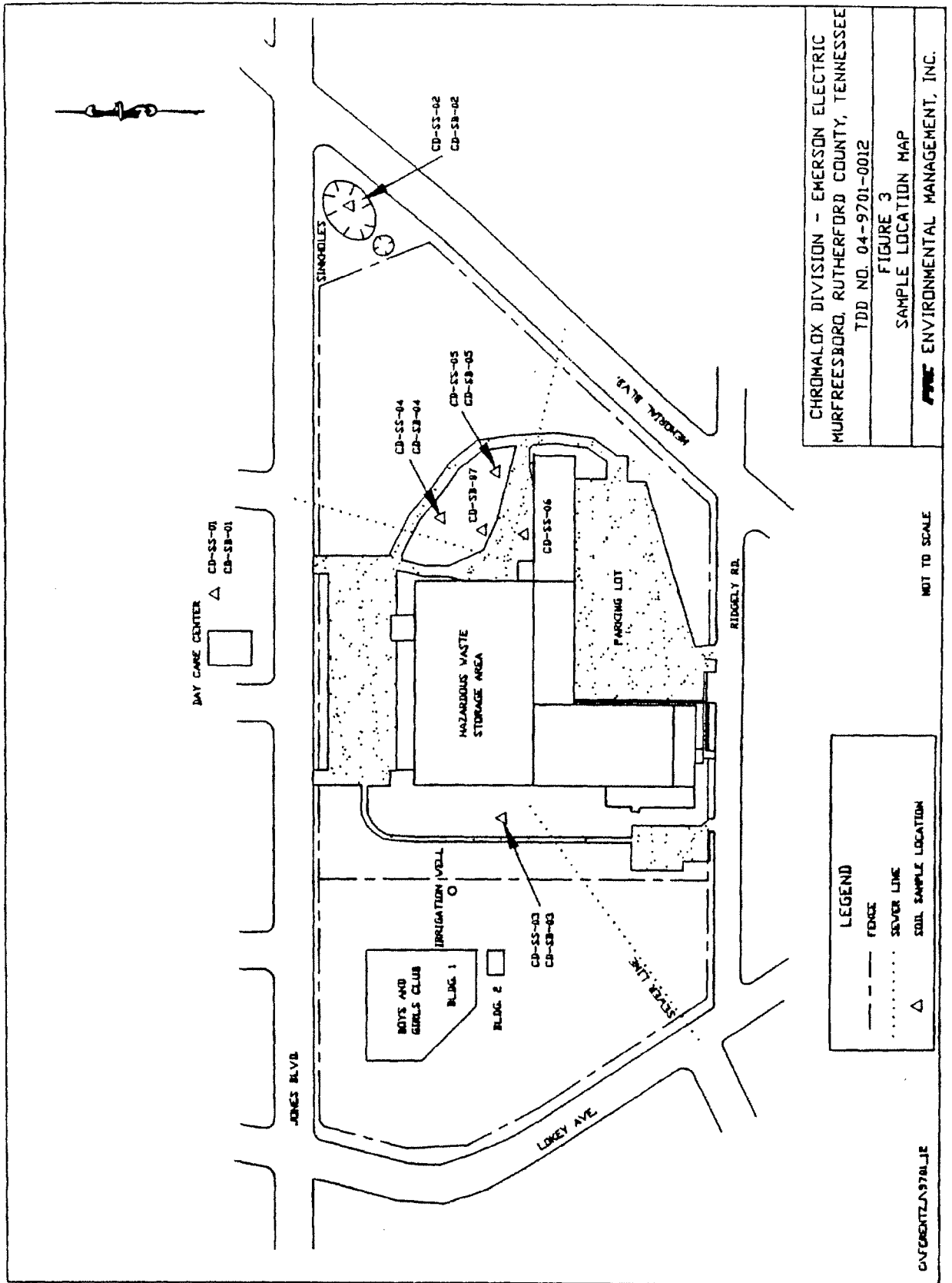


Figure 3 shows the sample locations, and Table 2 describes the subsurface soil sample locations. Samples were collected using stainless-steel augers, spoons, and Pyrex™ bowls. START personnel used a photoionization detector (PID) to screen for total VOCs in soils. The PID was used periodically while augering the soil borings (Ref. 7).

3.3 DRINKING WATER WELL SAMPLING

In the FSP, START proposed collecting three groundwater samples from potential source areas located within the Chromalox site property; however, due to subsurface conditions and the depth to groundwater (greater than 30 feet bgs), no groundwater samples were collected (Ref. 7).

4.0 ANALYTICAL RESULTS

All samples were submitted to EPA Contract Laboratory Program laboratories for full routine analytical services parameters. The analytical results for surface soil samples are presented in Tables 3 and 5. Subsurface soil sample analytical results are presented in Tables 4 and 6. The analytical results of the surface and subsurface soil samples were compared with those of the background sample to determine whether any substance was significantly elevated due to releases from on-site sources. The concentration of a constituent is considered to be elevated if the concentration is greater than or equal to three times the concentration detected in the background or control sample. In the cases where a constituent is undetected in the background or control sample, any concentration equal to or greater than the Sample Quantitation Limit (or detection limit) is considered to be elevated. Elevated levels of constituents are shaded in the analytical results summary tables. Significance above background was determined using the methodology outlined in the EPA document *Using Qualified Data to Document an Observed Release* (EPA, 1994).

4.1 SURFACE SOIL SAMPLES

Cadmium, chromium, copper, lead, magnesium, nickel, silver, and zinc were detected at elevated levels in the following surface soil samples: CD-SS-02, CD-SS-04, and CD-SS-05. Inorganic analytical results are presented in Table 3. Several semivolatile organic compounds (SVOC) as well as the following pesticides were detected at elevated levels in surface soil samples: heptachlor

TABLE 3
SUMMARY OF INORGANIC ANALYTICAL RESULTS
SURFACE SOIL SAMPLES

ANALYTE (mg/kg)	SAMPLE NUMBER				
	Background	On site			
	CD-SS-01	CD-SS-02	CD-SS-03	CD-SS-04	CD-SS-05
Aluminum	12,000	12,000	12,000	13,000	15,000
Antimony	1UJ	2UJ	1UJ	1UJ	2UJ
Arsenic	9.9J	11J	9.7J	8.8J	11J
Barium	300J	200J	150J	180J	210J
Beryllium	2.1	1.4	1.2J	1.4	1.7
Cadmium	0.26U	0.26U	0.25U	0.25U	6.5
Calcium	4,100	51,000	3,700	18,000	6,600
Chromium	20J	43J	34J	61J	110J
Cobalt	24	17	21	22	21
Copper	17	33	13	62	100
Iron	24,000	25,000	28,000	27,000	32,000
Lead	110J	440J	51J	53J	78J
Magnesium	600	4,900	580	1,000	1,200
Manganese	3,600J	1,900J	2,400J	2,500J	2,700
Mercury (total)	0.17	0.22	0.13U	0.13U	0.21
Nickel	14	15	14	63	110
Potassium	1,200	950	990	1,400	960
Selenium	1.7J	2UJ	1.6U	1.4J	1.2J
Silver	0.26U	0.26U	0.25U	0.25U	3.3
Sodium	230	300	190	230	260
Thallium	2.9	3.3	3.7JN	3.6JN	4.6JN
Vanadium	38	39	43	40	44
Zinc	78	320	55	51	300
Cyanide	0.7U	0.4U	0.5U	0.6U	0.7U

TABLE 3 (continued)

SUMMARY OF INORGANIC ANALYTICAL RESULTS
SURFACE SOIL SAMPLES

ANALYTE (mg/kg)	SAMPLE NUMBER	
	Background	On site
	CD-SS-01	CD-SS-06
Aluminum	12,000	14,000
Antimony	1UJ	1UJ
Arsenic	9.9J	9.6J
Barium	300J	140J
Beryllium	2.1	1.2
Cadmium	0.26U	0.24U
Calcium	4,100	18,000
Chromium	20J	41J
Cobalt	24	19
Copper	17	24
Iron	24,000	32,000
Lead	110J	37J
Magnesium	600	1,300
Manganese	3,600	1,800J
Mercury (total)	0.17	0.12
Nickel	14	34
Potassium	1,200	1,100
Selenium	1.7J	2UJ
Silver	0.26U	0.24U
Sodium	230	200
Thallium	2.9	4.6JN
Vanadium	38	23
Zinc	78	47
Cyanide	0.7U	0.2U

Notes:

- mg/kg - Milligrams per kilogram
 - CD - Chromalox Division
 - SS - Surface soil
 - U - Constituent analyzed for but not detected. Value reported is the minimum quantitation limit.
 - J - Estimated value
 - N - Presumptive evidence of presence of material
- Shaded areas indicate elevated concentrations of constituents greater than three times background.

TABLE 4
SUMMARY OF INORGANIC ANALYTICAL RESULTS
SUBSURFACE SOIL SAMPLES

ANALYTE (mg/kg)	SAMPLE NUMBER				
	Background	On site			
	CD-SB-01	CD-SB-02	CD-SB-03	CD-SB-04	CD-SB-05
Aluminum	16,000	14,000	14,000	20,000	21,000
Antimony	2UJ	1UJ	2UJ	2UJ	1UJ
Arsenic	12J	7.1J	7.4J	13J	8.9J
Barium	120J	110J	160J	83J	44J
Beryllium	1.2J	0.75J	1J	1.2J	1.3J
Cadmium	0.25U	0.24J	0.25U	0.25UJ	0.27U
Calcium	2,000	1,600	1,500	3,400	2,400
Chromium	44J	14J	13J	70J	25J
Cobalt	24	14	17	15	5.1J
Copper	9.4	9	14	23	20
Iron	39,000	19,000	22,000	51,000	48,000
Lead	34J	20J	19J	26J	14J
Magnesium	400	930	890	830	1,100
Manganese	1,900J	1,300J	2,400J	340J	180J
Mercury (total)	0.12U	0.12U	0.12U	0.13U	0.13U
Nickel	9J	9.3J	11	21	16
Potassium	770	730B	1,100	950	1,700
Selenium	1.9J	1UJ	1.6J	2.7J	2.7J
Silver	0.25U	0.24U	0.25U	0.25U	0.27U
Sodium	210	210	240	190	270
Thallium	6.1JN	2.9J	2.9	7.4JN	8.1JN
Vanadium	62	30	35	67	23
Zinc	29	33	39	38	41
Cyanide	0.2U	0.3U	0.06U	0.2U	0.1U

TABLE 4 (continued)

SUMMARY OF INORGANIC ANALYTICAL RESULTS
SUBSURFACE SOIL SAMPLES

ANALYTE (mg/kg)	SAMPLE NUMBER	
	Background	On site
	CD-SB-01	CD-SB-07
Aluminum	16,000	26,000
Antimony	2UJ	1UJ
Arsenic	12J	17J
Barium	120J	170J
Beryllium	1.2J	1.5
Cadmium	0.25U	0.26UJ
Calcium	2,000	1,000
Chromium	44J	46J
Cobalt	24	28
Copper	9.4	15
Iron	39,000	68,000
Lead	34J	79J
Magnesium	400	670
Manganese	1,900J	2,000J
Mercury (total)	0.12U	0.13U
Nickel	9J	18
Potassium	770	1,100
Selenium	1.9J	3.3J
Silver	0.25U	0.26U
Sodium	210	250
Thallium	6.1JN	10JN
Vanadium	62	85
Zinc	29	44
Cyanide	0.2U	0.1U

Notes:

- mg/kg - Milligrams per kilogram
 CD - Chromalox Division
 SB - Subsurface soil
 U - Constituent analyzed for but not detected. Value reported is the minimum quantitation limit.
 B - The concentration was detected between the instrument detection limit (IDL) and the Contract Required Detection Limit (CRDL).
 J - Estimated value
 N - Presumptive evidence of presence of material
 Shaded areas indicate elevated concentrations of constituents greater than three times background.

TABLE 5
SUMMARY OF ORGANIC ANALYTICAL RESULTS
SURFACE SOIL SAMPLES

ANALYTE (µg/kg)	SAMPLE NUMBER				
	Background	On site			
	CD-SS-01	CD-SS-02	CD-SS-03	CD-SS-04	CD-SS-05
Extractable Organic Compounds					
Acenaphthylene	190J	210J	---	---	---
Dibenzofuran	450J	85J	---	---	---
Phenanthrene	410J	3,100	640	150J	930
Anthracene	89J	460	45J	---	120J
Carbazole	64J	650	---	---	210J
Fluoranthene	1,400	8,800	1,300	380J	1,800
Pyrene	1,400	7,900	1,200	320J	1,600
Benzo(a)anthracene	630	3,700	430	120J	770
Chrysene	1,100	6,200	730	220J	1,200
Bis(2-ethylhexyl)phthalate	450U	---	---	---	1,200
Benzo(b/k)fluoranthene	2,000	8,100	1,300	380J	1,800
Benzo(a)pyrene	700	4,600	450	---	920
Indeno(1,2,3-cd)pyrene	1,000	5,500	490	140J	860
Benzo(ghi)perylene	1,200	6,400	550	170J	960
Miscellaneous Extractable Compounds					
Anthracenedione	NA	1,000JN	300JN	NA	NA
Benzantracenone	NA	500JN	300JN	NA	NA
Benzoic Acid	100JN	NA	100JN	NA	NA
Benzo pyrene (not a)	NA	3,000JN	NA	NA	NA
Carboxylic Acid	300J	500J	4,000J	800J	800J
Cyclopentaphenanthrene	NA	600JN	NA	NA	NA
Dibenzpyrene	NA	3,000JN	NA	NA	NA
Hydroxybenzaldehyde	NA	NA	NA	600JN	NA
Perylene	NA	10,000JN	NA	NA	800JN
Pesticides/PCBs					
Heptachlor Epoxide	2.3U	---	---	---	12
Endosulfan	14	69	10N	3.4	---
Endosulfan Sulfate	5.0JN	21UJ	4.3UJ	4.2UJ	4.5UJ
4,4'-DDT	7.1	---	---	---	---
Gamma Chlordane	2.3U	18	---	---	---
PCB-1254	45U	---	---	---	550

TABLE 5 (continued)

SUMMARY OF ORGANIC ANALYTICAL RESULTS
SURFACE SOIL SAMPLES

ANALYTE ($\mu\text{g/kg}$)	SAMPLE NUMBER	
	Background	On site
	CD-SS-01	CD-SS-06
Extractable Organic Compounds		
Phenanthrene	410J	---
Anthracene	89J	---
Carbazole	64J	---
Fluoranthene	1,400	---
Pyrene	1,400	---
Benzo(a)anthracene	630	---
Chrysene	1,100	---
Bis(2-ethylhexyl)phthalate	450U	---
Benzo(b and/or k)fluoranthene	2,000	---
Benzo(a)pyrene	700	---
Indeno(1,2,3-cd)pyrene	1,000	---
Benzo(ghi)perylene	1,200	---
Miscellaneous Extractable Compounds		
Benzoic Acid	110J	NA
Benothiazole	NA	90JN
Polychlorinated biphenyls (4 isomers)	NA	4,000JN
Carboxylic Acid	300J	NA
Pesticides/PCBs		
Endosulfan Sulfate	14	20UJ
PCB-1254	45U	3,500

Notes:

- $\mu\text{g/kg}$ - Micrograms per kilogram
 - CD - Chromalox Division
 - SS - Surface soil
 - U - Constituent analyzed for, but not detected. Value reported is the sample quantitation limit.
 - J - Estimated value
 - - Constituent analyzed for, but not detected.
 - NA - Not Analyzed
 - N - Presumptive evidence of presence of material
 - PCB - Polychlorinated biphenyls
- Shaded areas indicate elevated concentrations of constituents greater than three times background.

TABLE 6

**SUMMARY OF ORGANIC ANALYTICAL RESULTS
SUBSURFACE SOIL SAMPLES**

ANALYTE ($\mu\text{g/kg}$)	SAMPLE NUMBER				
	Background	On site			
	CD-SB-01	CD-SB-02	CD-SB-03	CD-SB-04	CD-SB-05
Purgeable Organic Compounds					
1,2-Dichloroethene	12U	----	----	----	----
Tetrachloroethene	12U	----	----	----	----
Pesticides/PCBs					
Endosulfan Sulfate	4.5UJ	4.2UJ	4.1UJ	4.2UJ	4.5UJ

TABLE 6

SUMMARY OF ORGANIC ANALYTICAL RESULTS
SUBSURFACE SOIL SAMPLES

ANALYTE ($\mu\text{g/kg}$)	SAMPLE NUMBER				
	Background	On site			
	CD-SB-01	CD-SB-02	CD-SB-03	CD-SB-04	CD-SB-05
Purgeable Organic Compounds					
1,2-Dichloroethene	12U	----	----	----	----
Tetrachloroethene	12U	----	----	----	----
Pesticides/PCBs					
Endosulfan Sulfate	4.5UJ	4.2UJ	4.1UJ	4.2UJ	4.5UJ

TABLE 6 (continued)

**SUMMARY OF ORGANIC ANALYTICAL RESULTS
SUBSURFACE SOIL SAMPLES**

ANALYTE ($\mu\text{g/kg}$)	SAMPLE NUMBER	
	Background	Onsite
	CD-SB-01	CD-SB-07
Purgeable Organic Compounds		
1,2-Dichloroethene	12U	6J
Tetrachloroethene	12U	5J
Pesticides/PCBs		
Endosulfan Sulfate	4.5U	4.4UJ

Notes:

- $\mu\text{g/kg}$ - Micrograms per kilogram
 CD - Chromalox Division
 SB - Subsurface soil
 U - Constituent analyzed for, but not detected. Value reported is the sample quantitation limit.
 J - Estimated value
 - - Constituent analyzed for, but not detected.
 PCBs - Polychlorinated biphenyls
 Shaded areas indicate elevated concentrations of constituents greater than three times background.

epoxide, endosulfan, endosulfan sulfate, and gamma chlordane. In addition, polychlorinated biphenyls (PCB) were also detected at elevated levels. Organic analytical results are presented in Table 5.

4.2 SUBSURFACE SOIL SAMPLES

Nickel was the only inorganic constituent detected at an elevated level in on-site subsurface soil samples. Subsurface inorganic analytical results are presented in Table 4. No organic constituents were detected at elevated levels in on-site subsurface soil samples. Subsurface soil organic analytical results are presented in Table 6.

4.3 DRINKING WATER SAMPLES

No drinking water samples were collected.

5.0 PATHWAYS

This section discusses the groundwater migration, surface water migration, soil exposure, and air migration pathways. Additionally, this section discusses the targets associated with each pathway and draws pathway-specific conclusions.

5.1 GROUNDWATER MIGRATION PATHWAY

The following discusses the geologic and hydrogeologic setting, groundwater targets, and conclusions regarding the groundwater pathway. Because groundwater samples were not collected, neither sample locations nor analytical results are presented.

5.1.1 Groundwater and Hydrogeologic Setting

The geology of this site comprises the Ridley Limestone bedrock formation, which is a massively bedded, pure limestone formation with a well-developed karst terrain. The Ridley Limestone, the most widely outcropping formation of the central basin, averages 100 feet in thickness and serves as a

shallow aquifer for the Murfreesboro area (Refs. 1, p. 4; 8; 14, pp. 214 and 215).

The Ridley Confining Layer separates the upper Ridley Limestone from the lower Pierce Limestone and is a thinly bedded, shaley limestone with a total thickness of about 25 feet. The Pierce Limestone also acts as a confining layer, which protects the underlying Murfreesboro Limestone from significant solution (Refs. 1, p. 4; 8; 14, pp. 214 and 215).

Underlying the Pierce Limestone is Murfreesboro Limestone, a massive, dense, pure limestone with a total thickness of approximately 420 feet. The Murfreesboro Limestone acts as a reliable aquifer (Refs. 1, p. 4; 8; 14, pp. 214 and 215).

Aquifers in this area, generally at depths of less than 200 feet, are typical of karst terrain, with groundwater occurring in a network of interconnected horizontal and vertical solution openings in an otherwise impervious limestone (Refs. 1, p. 4; 8; 15).

5.1.2 Groundwater Sample Locations and Analytical Results

Three groundwater sampling locations were proposed in the FSP; however, because of subsurface conditions and the depth to the groundwater (greater than 30 feet bgs), no groundwater samples were collected.

5.1.3 Groundwater Targets

Approximately 597 persons obtain potable water from groundwater wells located within a 4-mile radius of the site (Refs. 2; 16, pp. 8 and 9; 17). Most residents within a 4-mile radius of these wells have access to city water from the municipal water district (MWD) or from the Consolidated Utility District (CUD); however, it is assumed that those people who either choose not to use city water or do not have access to city water, obtain potable water from private wells. The MWD and CUD obtain water from surface water intakes located on the East Fork Stones River (Refs. 2; 17; 18; 19; 20; 21).

5.1.4 Groundwater Conclusions

The groundwater migration pathway is of some concern because of the potential for hazardous substances to migrate directly into a karst aquifer. Even though there is a limited number of groundwater targets located within the 4-mile target distance limit, no groundwater samples were collected during the SI because of subsurface conditions and the depth to groundwater.

5.2 SURFACE WATER MIGRATION PATHWAY

The following sections discuss the hydrologic setting, surface water targets, and conclusions regarding the surface water migration pathway. Because no surface water or sediment samples were collected, neither sampling locations nor analytical results are presented.

5.2.1 Hydrologic Setting

Surface water runoff generally flows south/southwest to Lytle Creek (located 2,500 feet from the site). Lytle Creek flows to the west approximately 0.9 mile, where it converges with the West Fork Stones River, which flows approximately 14.1 miles. The 15-mile surface water pathway is completed in the West Fork Stones River (Refs. 1; 2). The West Fork Stones River has an average discharge of 1,645 cubic feet per second (Refs. 2; 19).

5.2.2 Surface Water and Sediment Sampling Locations and Analytical Results

No surface water or sediment samples were collected during the SI.

5.2.3 Surface Water Targets

Both the MWD and the CUD maintain surface water intakes located on the East Fork Stones River; however, they are not located along the 15-mile surface water pathway. The West Fork Stones River and Lytle Creek are classified as fisheries and recreational streams and are also used for agricultural purposes (Refs. 1, p. 6; 22). The West Fork Stones River is also utilized for domestic and industrial purposes. There are no wetlands or federally or state designated endangered or threatened species

located along the 15-mile surface water pathway (Refs. 1, p. 6; 2; 22; 23). According to the Tennessee Wildlife Resources Agency, the West Fork Stones River has dramatically recovered from municipal wastewater pollution during the past 20 years (Refs. 1, p. 6; 22).

5.2.4 Surface Water Conclusions

The surface water migration pathway is of some concern because of the potential for hazardous substances to migrate by overland flow to Lytle Creek, but there are limited surface water targets located along the 15-mile surface water pathway. No surface water or sediment samples were collected during the SI.

5.3 SOIL EXPOSURE PATHWAY AND AIR MIGRATION PATHWAY

The following sections discuss the physical conditions of the soil, sample locations and analytical results, soil and air targets, and conclusions regarding the soil exposure and air migration pathways.

5.3.1 Physical Conditions

Soil on the site comprises three major types: Arrington silt loam, Bradyville silt loam, and Bradyville-rock outcrop complex. Arrington silt loam is a deep, well-drained, loamy soil with depths ranging from 3 feet or more and slopes from 0 to 3 percent. Bradyville silt loam is also deep, well-drained, and gently sloping with a surface layer from 4 to 10 inches thick and a depth to limestone bedrock of 40 to 60 inches (Refs. 1, p. 4; 24).

The Bradyville-rock complex consists of an intricate pattern of nearly level, well-drained soils and outcrops of limestone on uplands of the Inner Central Basin. The Bradyville soil between the outcrops has a surface layer of friable silt loam from 5 to 10 inches thick. In most cases, the subsoil consists of friable silty clay loam, which is underlain by firm clay (Refs. 1, p. 4; 24).

5.3.2 Sample Locations and Analytical Results

Contaminated soil at the hazardous waste storage area is the source of contamination at this site. Five surface and five subsurface soil samples were collected during the SI. See Figure 3 for the sample locations. The analytical results show elevated levels of inorganic and organic contaminants in the surface soils at the site. See Tables 3, 4, 5 and 6 for the analytical results.

Arthur D. Little, Inc., conducted a Phase I assessment in 1988, which identified a number of areas requiring further investigation. Minor spills of PCE and TCE and possibly other hazardous substances, which have been utilized at the facility during its years of operation, have occurred on the east side of the Chromalox main plant building. This area is now known as the hazardous waste storage area. Dames & Moore conducted a Phase II assessment in 1990 of the hazardous waste storage area. Analyses of soil samples collected show elevated levels of ethylbenzene, xylene, PCE, TCE, and degradation byproducts of PCE and TCE. A portion of the hazardous waste storage area (423 square feet) was removed in 1991. The hazardous waste storage area reportedly was not the only impacted area; however, it was the area with the highest levels of contamination (Refs. 1, p. 3; 13).

The site is completely enclosed by an 8-foot chain-link fence with three strands of barbed wire located at the top. The fence is in good condition, and there are no obvious signs of stressed vegetation at the site (Refs. 1, p. 2; 10).

No air samples were collected during the SI.

5.3.3 Soil and Air Targets

Approximately 46,063 persons are located within 1 mile of the site (Ref. 10). A day-care center, which enrolls 37 children, is not located within 200 feet of observed contamination nor within the site boundaries (Ref. 7) (Figure 2). A Boys and Girls Club is located on site and has 200 (120 during school months) children attending the facility, but it is not located within 200 feet of observed contamination (Ref. 7). Chromalox employs 85 people at this time (Ref. 7).

Although the contaminants suspected at the site are volatile, the quantity of contaminants is small; therefore, the contaminants are not likely to volatilize in concentrations great enough to pose a threat to the air pathway. No chemical odors were noticed during the site investigation, which START conducted on March 31 through April 2, 1997. Several federally designated endangered and/or threatened species are known to inhabit central regions of the entire state of Tennessee; however, their exact habitat locations are not known (Ref. 25). Approximately 50 acres of wetlands are located within 4 miles of the site (Ref. 1).

5.3.4 Soil and Air Conclusions

The soil exposure pathway is a pathway of concern because of the locations of the day-care center across the street from the site and the Boys and Girls Club on site; however, the day-care center is not located within the site property nor within 200 feet of observed contamination. The Boys and Girls Club is located within the site boundary, but it is not within 200 feet of observed contamination. Therefore, there is a lack of targets for the soil pathway. The air migration pathway is of some concern at the Chromalox site because of the number of people within the 4-mile target distance limit, but the contaminants are not likely to volatilize in concentrations great enough to pose a threat to the air pathway.

6.0 SUMMARY AND CONCLUSIONS

A number of hazardous wastes are or have been produced by Chromalox during the various tasks associated with the manufacture of electric heating units. These wastes include TCE, PCE, xylene, electroless nickel plating solution, acetone, 1,1,1-trichloroethane, waste paint products, electrical resins, varsol solvent, waste oils, waste corrosive liquids, waste flammable liquids, and hazardous waste solids (Refs. 1, p. 13; 5; 13). The exact amount of hazardous wastes produced by Chromalox is not known.

Several VOCs, SVOCs, PCBs, pesticides, and metals were detected at elevated levels in the soil samples collected at the site. See Tables 3, 4, 5, and 6 for actual concentrations. The groundwater migration pathway is of some concern because of the potential for hazardous substances to migrate directly into a karst aquifer, even though there is a limited number of groundwater targets located

within the 4-mile target distance limit. No groundwater samples were collected during the SI. The surface water migration pathway is of some concern because of the potential for hazardous substances to migrate by overland flow to Lytle Creek, but there are limited surface water targets located along the 15-mile surface water pathway. No surface water or sediment samples were collected during the SI. The soil exposure pathway is a pathway of concern because of the locations of the day-care center across the street from the site and the Boys and Girls Club on site; however, neither the day-care center nor the Boys and Girls Club are located within 200 feet of observed contamination. Therefore, there is a lack of targets for the soil pathway. The air migration pathway is of some concern at the Chromalox site because of the number of people within the 4-mile target distance limit, but the contaminants are not likely to volatilize in concentrations great enough to pose a threat to the air pathway.

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REMEDIAL SITE ASSESSMENT DECISION - EPA REGION IV

Page 1 of 1

EPA ID: TND047004940 Site Name: CHROMALOX DIV EMERSON ELECTRIC

State ID:

Alias Site Names:

City: MURFREESBORO

County or Parish: RUTHERFORD

State: TN

Refer to Report Dated:

Report Type: SITE INSPECTION 001

Report Developed by:

DECISION:

- ☒ 1. Further Remedial Site Assessment under CERCLA (Superfund) is not required because:
- ☒ 1a. Site does not qualify for further remedial site assessment under CERCLA (No Further Remedial Action Planned - NFRAP)
- ☐ 1b. Site may qualify for action, but is deferred to:
- ☐ 2. Further Assessment Needed Under CERCLA:
- 2a. Priority: ☐ Higher ☐ Lower
- 2b. Other: (recommended action)

DISCUSSION/RATIONALE:

LOW TARGETS

Site Decision Made by: ROBERT MORRIS

Signature: 

Date: 01/06/98

